My Approach to … Transferring from Pharmaceutical to Neuro-optometric Rehabilitative Management of Anisometropic Amblyopia

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Disclosures

- No Financial Interest in tools/ techniques used.

Summary Statement

Anisometropic amblyopia is benefiting from recent studies highlighting the value and long-term success of "perceptual learning." Parents wishing to do more for their child with amblyopia have often been involved in traditional and/or pharmaceutical management prior to seeking rehabilitative care.

A case is presented in which a patient was successfully transitioned into rehabilitative management while tapering pre-existing use of atropine.

Challenges in parent discussion points are presented as a key factor in gaining parent confidence while changing management strategy from a pharmaceutical to a rehabilitative treatment model.

Purpose

- Demonstrate the impact of active, visually-directed engagement on visual performance.
- Demonstrate that fixation and ocular motility training are not splinter skills, but rather *foundation* skills which potentiate greater binocular performance.
- Discuss management challenges *and opportunities* when engaging a parent who has been content with the medical model, *while still upholding respect for the traditional eye care professional.*

Outline

- Entering profile
- Interim profile
- Post-therapy profile
- Therapy provided
- Conversations & Management
- Case update: Ongoing Developmental Visual Guidance

Entering Profile: JB

- 5.4 yo girl
- Currently under OMD mx
- H/o Amblyopia OD, variable E(T)
- Patching age 3.10 thru 4.5: increased 3 to 8 hrs/day: unsuccessful.
- Atropine instituted at age 4.5, daily.
  Was using atropine QOD (directed to use QD, but became QOD due to resistance).
- History of stopping/ restarting atropine Tx with repeated progress during Tx/ regressions after.

Entering Profile: JB

- Parent conference 4 days prior to exam: "Had a cycloplegic refraction yesterday"
  - Record showed "Large LET"
  - All prior records showed small accommodative ET.
- *I requested patient switch to QOHS prior to optometric exam.*

"Is there anything to be done for rehabilitation for amblyopia?"

Parent has functional concerns…

- Bumps into things
- Trouble walking downstairs
- Very cautious
- Has a bad sense of orientation
  - Gets lost in large areas
- Challenges with drawing skills
- Extremely bright when it comes to verbal skills and auditory learning & music

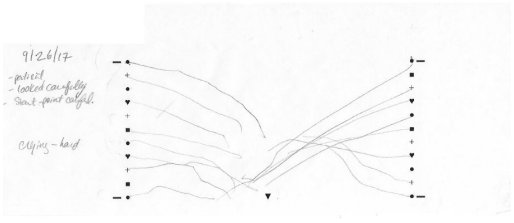
Entering Profile: JB (age 5.6)

	Distance	Near
OD +2.75 sph	20/40	20/32
OS +0.25 sph	20/30-	20/25
OU	20/30	20/32

Leans in/ chin down for near

- VO Star: hypo-projects OU; high eso; poor grasp OU, OS < OD; Profuse tearing
- 100" Wirt, (-) RDS
- Cannot fixate or follow beyond central 10°
- Nearpoint ret, balanced accn w/ **+4.00 OD/ +1.25 OS**
- Added Yoked Prism: **1^BD OU**, righted posture
- *Continue Atropine 1% 1gtt OS QOHS*

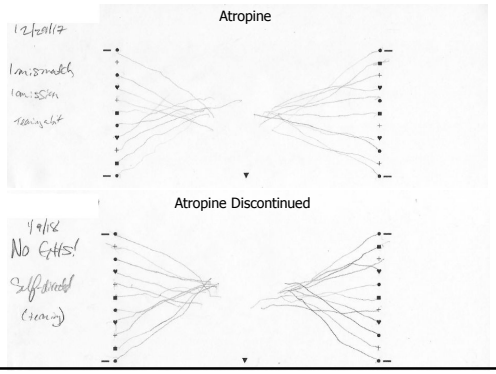
Entering VO Star



Interim Profile after 3 mos VT, Age 5.9

- Improvements in ocular motility
- Assessment performed while still on atropine QOHS, with last dose 16 hrs earlier.
- Attained weak RDS (presence/absence of shapes, but not identification)
  40" Wirt circles
- Near VA limited due to atropine, and negative BI recovery at distance.
- *Requested follow-up exam after 10 day atropine washout.*

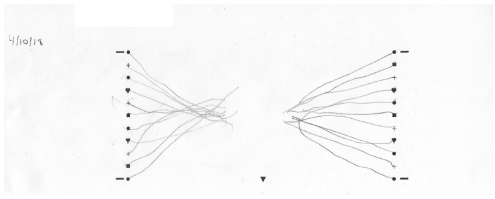
After first 3 mos VT, on & off A



Interim Profile, Age 5.9, 6.0

- **Temper tantrums!** new emergence on D/C atropine: More willful (and more effective at exercising will with functioning accn!)
- Monitored after 3 mos without atropine, no VT (age 6.0):
  - Improvements in stereo: (+) RDS 250" and 20" Wirt.
  - Still closing OS to engage processing OD
  - Crowding OD, BC DVA 20/30 OD
  - Poor fusion at D and N, negative or no recoveries.
  - AHP, tilt to right
- *Recommended additional 3 mos VT*
  - Develop Binoc recoveries
  - Develop Accn OD, OS OU
  - Develop Fixation, esp. 2^ gaze

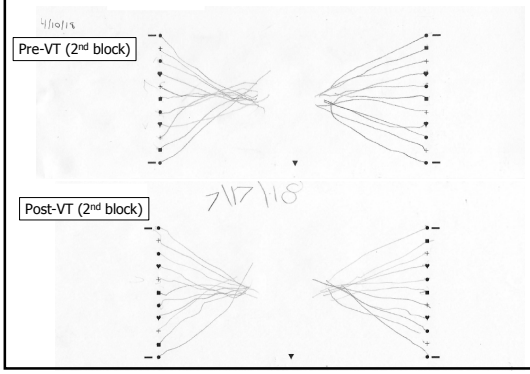
After 3 mos w/o Atropine, no VT



Post-Therapy Profile, Age 6.4

- Immediately post-therapy:
- Greatest progress areas:
  - Ocular motility
  - Sustained ranges with positive recoveries
  - Reducing esophoria thru near add
  - Reduced AHP
- *Recommended some maintenance activities:*
  - Continue to build MAR and fixation
  - Work with Marsden Ball
  - Saccadic/ Body organization, visual-motor-speech planning (slap tap reading series)

After 2nd VT block (3 mos)



Therapy Provided, 1st block

- **Visually-guided motor activities** integrated with a metronome and saccadic eye movements
  - Organized either:
    - Central-peripheral
    - Left-to-right and top-to-bottom
  - At near-point, fine motor control was engaged with touching or manipulating small objects with pincer grasp for visually-guided motor control and feedback for accuracy.
    - Pegs, Blocks,"Birthday Cake" rings around sticks
    - VMF series
  - At longer distances, feedback was supported with aiming a flashlight and observing accuracy of motor control within a visual target.
    - Central-peripheral patterns
    - 4-Corner Saccades

Therapy Provided, 1st block

- **Visual information processing skills** over a broad retinal area were presented, including:
  - Visual-spatial memory exercises, encouraging viewing over an area with tachistoscopic ("fast look") exposure;
  - Visual-sequential memory exercises, encouraging ability to track a moving target over a stable area and to reproduce the pattern.
- **Smooth pursuit exercises** were conducted with:
  - Peg insertion into a rotating pegboard
  - Marsden Ball smooth pursuits (Greenwald series)
    - Cognitive tasks were added to improve automaticity of eye movements without conscious control.

Therapy Provided, 2nd block

- **Accn-** MAR at D, N; Bi-ocular AR
- **Stereo-** relative depth; jump ductions
- **Marsden Ball-** looming, VMI series, bunt ball, ball/loop; smooth pursuit (Greenwald)
- **Visual-vestibular activities-** Infinity Walk; "Slotnick Scramble"
- **VMI-** bisecting; spatial planning ("line patterns" horizontal & vertical); Chalkboard Circles

Conversations & Management

- Challenges to overcome:
  - Mother presented to OMD that she was considering VT.
  - OMD Notes "Considering VT-Slotnick. Not sure what her goal is to have eval."
  - OMD writes in A/P: **"Do not rec VT- no indication"** Along with:
    - "Large LET
      Mixed amblyopia OD, improving.
      Continue Atropine QOD OS
      Update Rx to +3.25 / +1.00
      Check in 3 mos"

Conversations & Management

- Extended discussion around why changing atropine to HS rather than AM
  - Atropine enables MFBF, but *disables feeling of control* over vision
  - Longer wear-off period creates more opportunities for control by daytime (esp. 2nd day, QOHS).
  - Active therapy is enhancing JB's control over each eye…which is more effective than simply handicapping the preferred eye!
- Interim discussion: Some regressive behavior, "temper tantrums" once she was taken off atropine: more willful (and more effective at exercising will!)

Conversations & Management

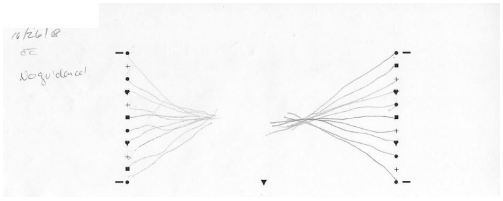
- Parent fear of D/C'ing atropine… "won't she need this for life?"
  - Multiple occasions requiring education on purpose of atropine and effect of atropine on focusing control.
- Ongoing reinforcement of concept of "Developmental visual guidance"
  - Long term monitoring of visual system;
  - Recommendations for changes in Rx,
  - Possible short-term therapy or reinforcing home activities as indicated.

Case Update, Ongoing Developmental Visual Guidance

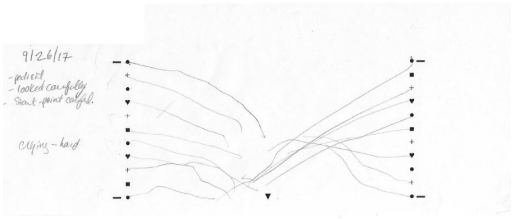
Post-Therapy Profile, Age 6.7

- 3 mos post-therapy:
  - Continues to get (+)RDS stereo and 20" Wirt.
  - Regression in ocular motility performance
  - Regression in binocular recoveries at distance, near.
  - Demonstrated 2^RET at DV only. Increased Rx (+) power stabilized turn.
  - *Modified Rx, increased plus at DV, maintained unequal adds*
    - OD +4.75 sph /+1.25 ADD
      OS +3.00 -0.50 x 180 /+0.75 ADD

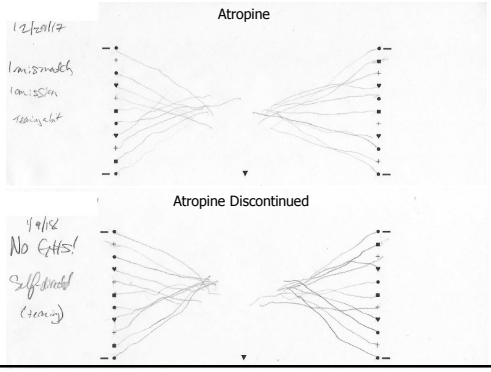
After 3 mos post-VT



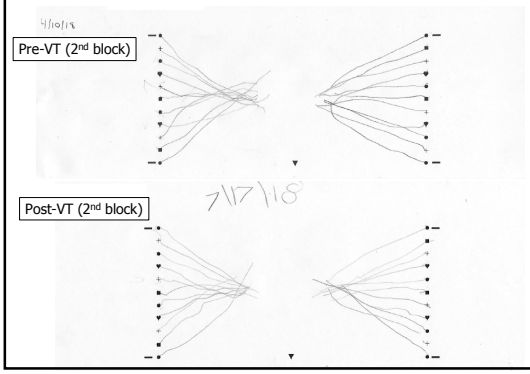
Entering VO Star



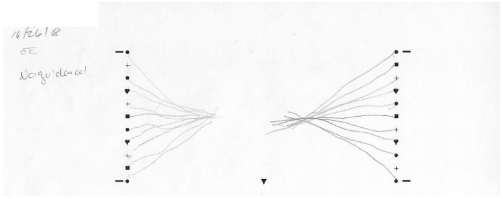
After first 3 mos VT, on & off A



After 2nd VT block (3 mos)



After 3 mos post-VT



Post-Therapy Profile, Age 6.9

- Additional 8 weeks, following Rx update:
  - No ET at distance,
  - Improved DVA OD, Improved NVA OD (20/16!)
  - Improved ocular motility performance
  - Stable binocular ranges and recoveries in phoropter.
  - Improving accom amplitudes
  - Small right hyperphoria identified in phoropter only, increases on prolonged dissociation in phoropter.
  - Plan to monitor quarterly
  - Educate mother there may be opportunities for future VT as demands change.

Take Home Lessons

- Transitioning a **parent** from medical/pharmaceutical Mx of Amblyopia to Rehabilitative Mx presents challenges in *parent education.*
- While gaining parent confidence in the effectiveness of an active VT Rehab program (esp. when OMD warns against it), it may be worth **continuing existing atropine penalization**, short term.
- Pauses between VT blocks give both parent and doctor the opportunity to monitor stability of vision gains.
- Pulsed VT blocks also help parent to appreciate objectives of treatment, and builds confidence in management plan when gains are maintained.

Take Home Lessons

- Fixation accuracy and oculomotor control are foundational skills which facilitate:
  - better acuity, which in turn facilitates
    - better appreciation of accommodative control,
  - visual information processing over a retinal area (saccades), which in turn facilitates
    - better binocularity
- Fixation and oculomotor skills may be developed in the presence of atropine Tx.

Age	5.6 years.mos	5.9 years.mos	5.9 years.mos
Atropine?	Atropine OS, 40 hrs ago	Atropine OS, 16 hrs ago	no atropine x 10 days
VT?		post 12 sessions VT	post 12 sessions VT
Wearing Rx OD	+2.75 sph	+4.00 sph = 1^BD	+4.00 sph = 1^BD
OS	+0.25 sph	+1.25 sph = 1^BD	+1.25 sph = 1^BD
DVA			
OD	20/50, 40	20/50, 30^{-2}	20/40-, 30^{-2}
OS	20/40, 30-	20/40, 30+	20/30, 25^{-2}
OU	20/30, --	20/40, 25	20/30, 25"
NVA			
OD	20/32, 25	20/20	20/50, 20
OS	20/25	20/32	20/25+
OU	20/32, 25	20/25	20/25, -, 16
Cover Testing			
Dist	UCT: Φ	4^EP	UCT:4^RET
	ACT: 6-8 EP		ACT: 6^eso
Near	UCT: Φ'	8-12^ EP' w/ inc attn recovers quickly	Φ'
	ACT: 8^EP'		
RDS stereo	(-)	Entering: (+) absence/ presence depth After eval, with +1.75 OS: (+)500"	(-); at end, c +5.50/+3.00 (+) 250"RDS
Wirt stereo	100"	140", 40"	70"; repeat c TF: 40"
			At end of exam, thru TF: +5.50 OD/ +3.00 OS:

6.0 years.mos	6.4 years.mos	6.7 years.mos	6.9 years.mos
no atropine	no atropine	no atropine	no atropine
after new Rx/ pause VT	after 12 sessions VT	Assess stability/ no VT	after new Rx, no VT
Unequal ADDS: +4.25 sph/ +1.25	Unequal ADDS: +4.25 sph/ +1.25	Unequal ADDS: +4.25 sph/ +1.25	Unequal ADDS: +4.75 sph/ +1.25
+2.25 sph/ +0.75	+2.25 sph/ +0.75	+2.25 sph/ +0.75	+3.00-0.50x180/ +0.75
20/50, $40^{-2\ crowd}$,WL:40"	20/40, 30^{-2}	20/50, $30^{-/++}$	20/40, 25^{-3}
$20/25^{-2}$, 20^{-3}	$20/25^{-1,+2}$	$20/25^{-2}$, 20^{-2}	$20/25^{-}$, 20^{-3}
25, --	30,25"$^{-++}$	20/20-	20/25, 20^{-2}
20/32,-;20	20/40, 25	20/32,+	20/20, 16
20/25,-;16	20/20,+	20/25,-;16	20/25, 20
20/25,-16	20/50, 25, 16	20/32,-;20	20/25
	UCT:2^RE(T)	UCT:2^RET	UCT: Φ
Φ	ACT: 3-4^eso	ACT: 4^eso	2-3^EP
	DV: 6-8^EP'	UCT: Φ'	UCT: Φ'
4-6^EP'	ADD: 3-4^EP	ACT: 6->4^EP'	4^EP'
(+)250"	(+)250"	(+)250"	(+)250"
70",20"	100",40",20"	70",30",20"	50", 20"
4 - 3+ - 4+	5 - 5 - 4	3 - 2+ - 3+	5 - 3 - 4+

Age	5.6 years.mos	5.9 years.mos	5.9 years.mos
Wirt stereo	100"	140", 40"	70"; repeat c TF: 40"
			At end of exam, thru TF: +5.50 OD/ +3.00 OS:
NSUCO Pursuits	1 - 1+ - 2	3 - 2 - 4	4 - 3 - 4+
NSUCO Saccades	1 - 1+ - 1	4 - 4+ - 2+, eyes, then head	2+ 3 - 4
Wolff Wand Rotations	~1+	3+, 10 sec fixation	~3+
WW Fixations	~1, OS tropes LET at near	3+	~3+
	Cannot sustain a fixation Can't hold N/F fixation Poor inhibition	trouble c release/ divergence	difficulty c inhibn
Retinoscopy OD	+4.75 sph	+5.00 sph	+5.25 sph
OS	+1.50 sph	+3.25 -0.75 x 180	+3.50 sph
Subjective, c VA OD	+4.75 sph 20/60, 50^{-2}	+5.00 -0.50 x 090, $20/25^{-3}$	+4.25 sph, 20/25+
OS	+1.75 sph 20/30-, 25^{-3}	+3.00 -0.50 x 180, $20/25^{+/-}$	+2.50 sph, $20/20^{-3}$
Binoc Balance OD		+4.50 sph	+4.25 sph
OS		+2.25 sph ; $20/20^{-3}$ (drops cyl)	+2.50 sph, $20/25^{-2}$

6.0 years.mos	6.4 years.mos	6.7 years.mos	6.9 years.mos
(+)250"	(+)250"	(+)250"	(+)250"
70",20"	100",40",20"	70",30",20"	50", 20"
4 - 3+ - 4+	5 - 5 - 4	3 - 2+ - 3+	5 - 3 - 4+
4 - 2+ - 4+	5 - 4+ - 5	3 - 2+ - 3	5 - 4 - 4+
4	5	3+-4	4+
4+	5-	3+	4
saccades: occ'l pause at midline	blinks betn N/F at times	Rotations degrade on obliques, increased fixation loss. Fixations- oriented, good inhibition; OD lags to fuse distal wand; weak stability of fixation >2sec.	Rotns: jaw engages Fixns: trouble with inhibition: early divergence.
+5.50-0.25x180	+5.50 sph	+5.75-0.25x005	+5.75-0.75x175
+2.75 sph	+3.50-0.50x160	+4.00-0.50x160	+3.50-0.75x175
+4.50sph; closing OS, 20/30	+4.75, 20/30-	+5.00sph, $20/30^{-2}$	+5.00 sph, $20/25^{-2}$+(WL)
+2.50sph, $20/25^{-3}$	+2.75-0.50x160, $20/20^{-3}$	+3.00-0.75x145, $20/20^{-2}$	+3.00-0.75x180, $20/20^{-2}$
+4.50 sph	+5.00 sph	+4.75sph	+4.75sph
+2.25 sph, $20/25,20^{-2}$	+2.50-0.50x160, 20/20`	+3.00-0.50x145, $20/20^{-2}$	+3.00-0.50x180, $20/20^{-2}$

Age	5.6 years.mos	5.9 years.mos	5.9 years.mos
Distance: VG phoria		1 exo, 2^BU OS	2 exo, 2^BU OS; LI 6/3 (BU) LS 2/0 (BD)
BO BI		BO x / 19 / 4 BI x / 7 / -4	BO x / ~40 / 4 BI x / 18 / 0 (delayed reports, OD suppressing)
Near: VG phoria			2 exo, Θ
BO BI		BO x / 19 / 4 BI x / 7 / -4	BO x / 20 / 4 BI x / 26 / 6
Additional assessments	MEM: OD+4.00 ~+0.50 lag OS+1.75: leads +4.00 +1.25 ~ balances engagemt accepts 1^BD OU, stabilizes gait; NVA: 20/25 OU DVA: 20/50, 25^{-2} OU		FCC +0.50(V) UFCC +5.75 sph +2.25 sph MEM c TF: +4.50 ~+1.00 lag +2.75~+0.50 lag Engages, comfort c: OD +5.50 OS +3.00 "subtract" -0.75 OU, pref to "-1.00" for DV TF DV: + 4.75 OD +2.25 OS: 1-2^RET, 4^eso

6.0 years.mos	6.4 years.mos	6.7 years.mos	6.9 years.mos
12 eso, 2^BU OS		3 eso, 2^BUOS	4 eso, 1.5^BU->3^BU OS
BO x / 24 / NR BI (NR) / -12(BO)	PB BO x / 25 / 16 BI x / 14 / 10	BO x / 27 / 2 BI x / 36 (late report) / 1 "I focused on the not real one"	BO x / 32 / 14 **BI x / 12 / 3**
3 exo		10 eso, 1.5^BUOS	2 eso, Θ
BO x / 40 / NR BI x / 20 / -12	PB BO x / 40 / 25 BI x / 16 / 1	BO x / 21 / 7 BI x / 35/ 5	BO x / 24 / 15 BI x / 11 / 5
	free space: TF +5.00 sph +2.50-0.50x160 accepts -0.50 OD; -0.75 OD decreases VA OU cyl x160=x180 OS. MEM, best symmetry +0.75 OU	TF: DV Balance: accepts -0.50 DC x 180, $20/20^{-1}$ Improved OD fixation, Dist CT: Φ MEM: tried +0.75 OU over bal: reads, slightly dim reflex OD. Changed to +1.25 OD/ +0.75 OS: brighter reflex, engaged with low lag, increased fluency: Easy 20" stereo on Wirt.	UFCC over balance: OD +1.25 OS +0.75(V) Repeat FCC with above: Takes OD +1.50(H) OS +1.00(H)

Additional assessments	MEM: OD+4.00 ~+0.50 lag OS+1.75: leads +4.00 +1.25 ~ balances engagemt accepts 1^BD OU, stabilizes gait; NVA: 20/25 OU DVA: 20/50, 25^{-2} OU		FCC +0.50(V) UFCC +5.75 sph +2.25 sph MEM c TF: +4.50 ~+1.00 lag +2.75~+0.50 lag Engages, comfort c: OD +5.50 OS +3.00 "subtract" -0.75 OU, pref to "-1.00" for DV TF DV: + 4.75 OD +2.25 OS: 1-2^RET, 4^eso Pref +4.25 OD +2.25 OS @DV, $20/25^{+2}$
Age	**5.6 years.mos**	**5.9 years.mos**	**5.9 years.mos**
Rx given	OD +4.00 sph = 1^BD OS +1.25 sph = 1^BD		Unequal ADDS: OD +4.25 sph/ +1.25 OS +2.25 sph/ +0.75
			RTC 3 mos, no VT

	free space: TF +5.00 sph +2.50-0.50x160 accepts -0.50 OD; -0.75 OD decreases VA OU cyl x160=x180 OS. MEM, best symmetry +0.75 OU	TF: DV Balance: accepts -0.50 DC x 180, $20/20^{-1}$ Improved OD fixation, Dist CT: Φ MEM: tried +0.75 OU over bal: reads, slightly dim reflex OD. Changed to +1.25 OD/ +0.75 OS: brighter reflex, engaged with low lag, increased fluency: Easy 20" stereo on Wirt.	UFCC over balance: OD +1.25 OS +0.75(V) Repeat FCC with above: Takes OD +1.50(H) OS +1.00(H)
6.0 years.mos	**6.4 years.mos**	**6.7 years.mos**	**6.9 years.mos**
Resume VT, develop accn and binoc, and fixation across midline	consider cyl OS, consider +0.75 OU RTC 3 mos	Update Rx to stabilize Dist E(T): Unequal ADDS: OD +4.75 sph/ +1.25 OS +3.00-0.50x180/ +0.75	continue with Rx
		RTC 6-8wks	RTC: Monitor Qtrly, guide visual development

Discussion welcome!

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